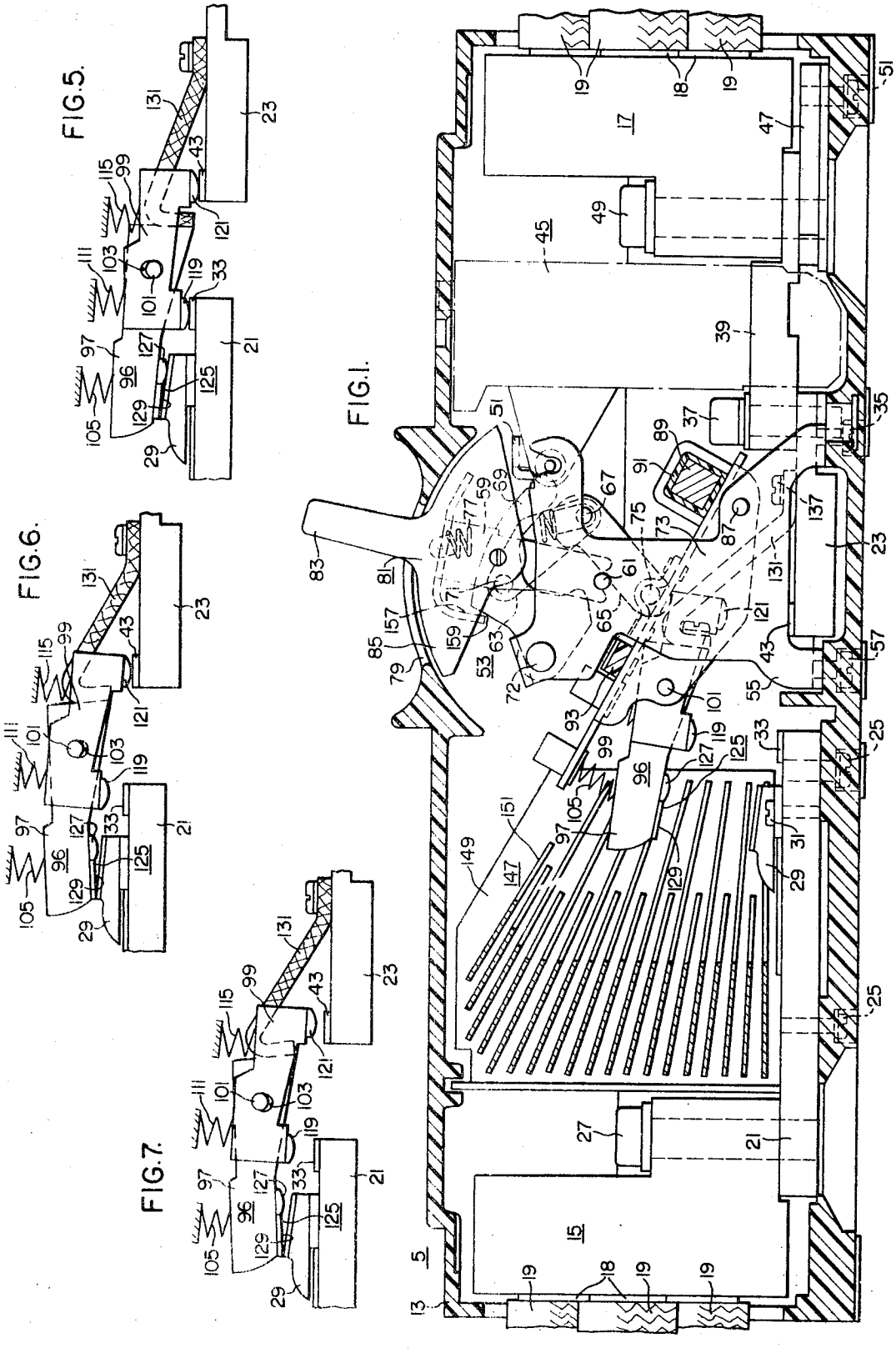
May 19, 1970 A. R. CELLERINI ET AL 3,513,275

CIRCUIT BREAKER WITH IMPROVED CURRENT PATH AND CONTACT MEANS

Original Filed April 14, 1966 2 Sheets-Sheet 1



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CIRCUIT BREAKER WITH IMPROVED CURRENT PATH AND CONTACT MEANS

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2 Sheets-Sheet 2

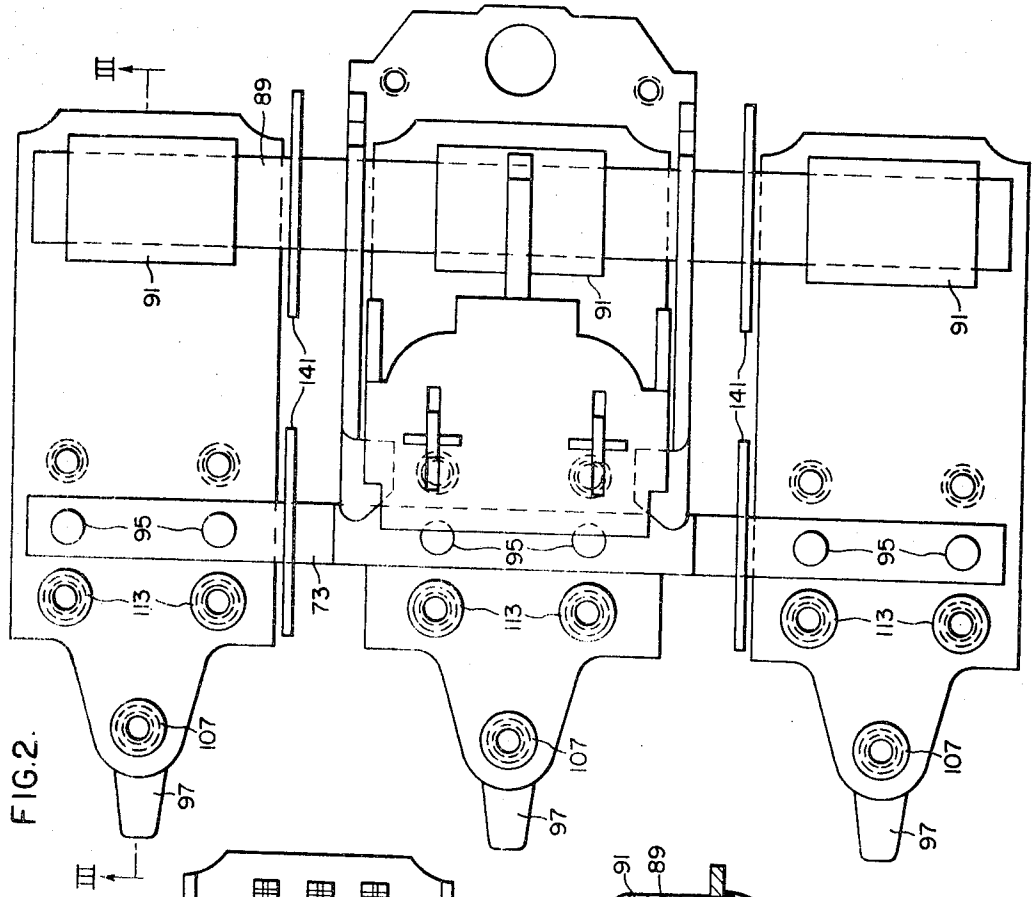


FIG.2.

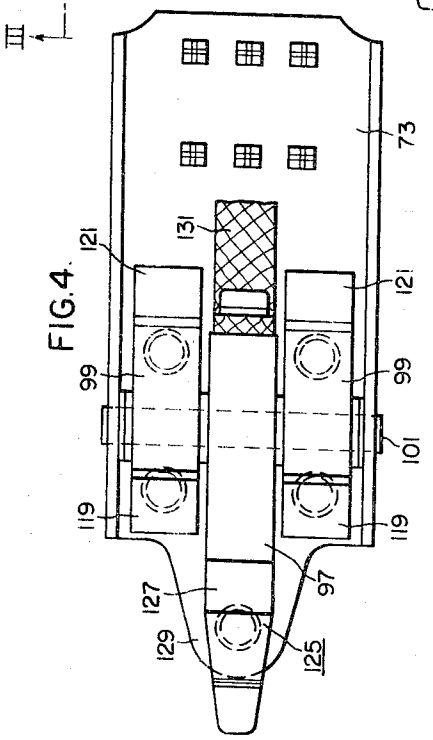


FIG.4.

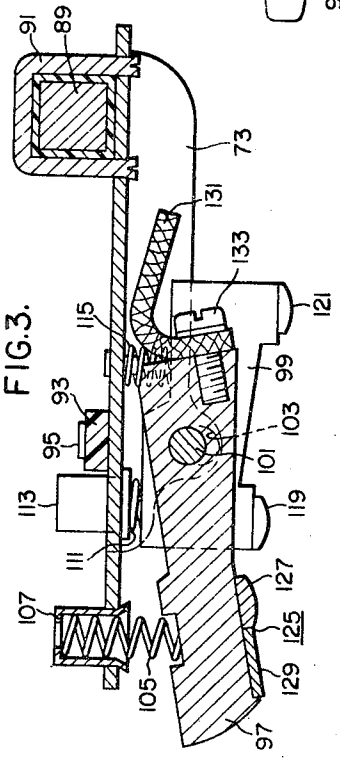


FIG.3.

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3,513,275

CIRCUIT BREAKER WITH IMPROVED CURRENT PATH AND CONTACT MEANS

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Continuation of application Ser. No. 542,536, Apr. 14, 1966. This application Oct. 4, 1968, Ser. No. 765,143
Int. Cl. H01h 9/38, 33/12
U.S. Cl. 200—146 9 Claims

ABSTRACT OF THE DISCLOSURE

A circuit breaker comprises an improved curent path and contact means that provides a rigid conducting main current path structure between a pair of spaced stationary conductors in the closed position of the contacts.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of our application Ser. No. 542,536, filed Apr. 14, 1966, now abandoned, and entitled "Circuit Breaker With Improved Current Path and Contact Means."

BACKGROUND AND OBJECTS OF THE INVENTION

In the circuit breaker art, it is old to provide a first rigid stationary conductor having a stationary contact thereon, a second rigid stationary conductor spaced from the first stationary conductor and a rigid movable contact arm that cooperates with the stationary contact and that is connected to the second stationary conductor by means of a flexible shunt to thereby provide a current path between the first stationary conductor and the second stationary conductor in the closed position of the contacts. The flexible shunt is usually attached to the movable contact arm and to the second stationary conductor by means of rivets or screws, and solder is provided at the connection. As the circuit breakers are operated over a period of time these connections can be weakened by the forces acting thereon during opening and closing operations of the breaker. Moreover, the solder generally has a relatively low melting point so that the connection can further deteriorate under high temperature conditions. Circuit breakers having increased current carrying ratings are more vulnerable to this undesirable weakening and deterioration of the connections. Moreover, as the ratings of the circuit breakers are increased the cross section of the flexible shunt is increased in order to handle the increased current so that for higher rated breakers the shunt can become very bulky necessitating an increase of space in the circuit breaker housing. It is also difficult to provide a shunt that has enough cross section to carry increased current and that is also flexible enough that the shunt will not affect the operation of the movable parts of the breaker by interfering with the mechanical motion and by introducing forces that adversely affect the contact pressure in the closed position of the circuit breaker.

Accordingly, an object of this invention is to provide a circuit breaker with an improved current path structure and contact means that provides a rigid conducting current path structure between a pair of spaced stationary conductors in the closed position of the contacts.

Another object of this invention is to provide an improved circuit breaker comprising an arc-extinguishing structure and an improved multipole contact structure constructed to open in a sequence that will draw the arcs in proximity to the arc-extinguishing structure.

Another object of this invention is to provide an improved circuit breaker having an improved contact structure.

A further object of this invention is to provide an improved insulating-housing type circuit breaker with an improved current path structure and contact structure that provides increased reliability in operation over an extended period of time.

The invention, both as to structure and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description when read in conjunction with the accompanying drawings.

In said drawings:

FIG. 1 is a side sectional view of a circuit breaker embodying the principal features of this invention;

FIG. 2 is a top plan view of the movable contact device of the circuit breaker of FIG. 1;

FIG. 3 is a sectional view taken generally along the line III—III of FIG. 2;

FIG. 4 is a bottom plan view illustrating one of the contact structures of FIG. 2;

FIGS. 5, 6 and 7 are schematic views illustrating three positions of the contacts during operation of the circuit breaker.

Referring to the drawings, there is shown, in FIG. 1, a molded-case or insulating-housing type circiut breaker **5**. The circuit breaker **5** comprises an insulating housing comprising a molded insulating base **11** and a molded insulating cover **13**. Suitable insulating barrier means separates the housing **11**, **13** into three adjacent including compartments for housing the three pole units of the multi-pole circuit breaker in a manner well known in the art. In each pole unit, a pair of solderless terminals **15**, **17** are provided at the opposite ends of the associated insulating compartment to enable connection of the circuit breaker in an electric circuit. Each of the terminals **15**, **17** comprises a rigid block of conducting material having a plurality of openings in the end thereof for receiving the uninsulated wire parts **18** of cables **19**. Each of the terminals **15**, **17** is provided with tapped opening means accessible from the upper front thereof for receiving threaded screw-type connecting members that are threaded into the tapped opening means to engage the uninsulated parts **18** of the cables **19** to provide pressure-type connections of the cables to the terminal in a manner known in the art. The terminals **15**, **17** are of the type specifically described in the now abandoned patent application of A. R. Cellerini et al., Ser. No. 8,819, filed Feb. 15, 1960 and assigned to the assignee of the instant case.

In each of the three pole-unit compartments of the circuit breaker there is a rigid stationary conductor **21** and a rigid stationary conductor **23**. The conductor **21** is secured to the base **11** of the insulating housing by means of threaded bolts **25** that are threaded into tapped openings in the conductor **21**. The terminal **15** is secured to the conductor **21** by means of a bolt **27** that passes through a vertical opening in the terminal **15** and that is threaded into a tapped opening in the conductor **21**. A stationary contact **29** is fixedly secured to the front of the conductor **21** by means of a pair of bolts **31** (only one of which is seen in FIG. 1) that pass through flange parts of the contact member **29** and that are threaded into suitable tapped openings in the conductor **21**. A stationary contact **33** is welded or otherwise fixedly secured to the front of the conductor **21** adjacent the space between the spaced conductors **21**, **23**. The rigid conductor **23** is secured to the insulating base **11** by means of a bolt **35** that is threaded into a tapped opening in the bottom of the conductor **23** and also by means of a bolt **37** that passes through an opening in a conductor **39** and through an opening in the conductor **23** which bolt **37** is threaded into an opening in the housing base **11**. A stationary

contact **43** is fixedly secured to the front of the conductor **23** adjacent the opening between the conductors **21, 23.** The conductor **39** is a rigid conductor that passes through an opening in a removable trip device **45.** The trip device **45** is energized by current in the conductor **39** to effect tripping operations in response to overload currents. The conductor **39** is secured to the conductor **23** and base **11** at one end thereof by means of the mounting bolt **37.** The conductor **39** is secured, at the other end thereof, to a rigid conductor **47** by means of a bolt **49** that passes through a vertical opening in the terminal **17** and through a vertical opening in the conductor **39** and that is threaded into a suitable tapped opening in the rigid conductor **47.** The conductor **47** is fixedly secured to the base **11** by means of two bolts **51** (only one of which is seen in FIG. 1) that are threaded into tapped openings in the conductor **47.** The bolt **49** secures the terminal **17** and conductor **39** to the conductor **47.** Except for the openings therein for receiving the mounting members, the rigid conductors **21, 23, 39,** and **47** are solid conducting members. Except for the openings for receiving the cables **19,** the openings for receiving the bolts **27, 49** and the openings for receiving the threaded connectors that secure the cables **19** to the terminals **15, 17,** the rigid terminal members **15, 17** are solid conducting members.

The removable trip device **45** is a thermal-magnetic trip device comprising a latch structure **51** that is automatically released in response to overload currents through any of the pole-units of the circuit breaker in order to effect tripping operations of the circuit breaker in a manner to be hereinafter more specifically described. The trip device **45** is of the type specifically described in the patent to A. R. Cellerini et al., Pat. No. 3,141,081.

A single operating mechanism **53,** for controlling all three pole units, is mounted in the center pole unit of the circuit breaker. The operating mechanism **53** comprises a supporting frame member **55** thtt comprises space supporting plate parts, which supporting frame member **55** is secured to the molded insulating base **11** by means of a plurality of bolts **57** that are threaded into tapped openings in the frame **55.** The operating mechanism **53** comprises a pivoted forked operating lever **59** that is supported for pivotal movement about a support pin **61** that is supported on the frame **55.** A toggle comprises an upper toggle link **63** and a lower toggle link **65** which links are pivotally connected by means of a knee pivot pin **67:** The upper toggle link **63** is pivotally connected to a movable trip member **69** by means of a pin **71.** The trip member **69** is pivotally supported on the frame **55** by means of a pivot pin **72.** The lower toggle link **65** is pivotally connected to a contact support member **73** of the center pole unit by means of a pin **75.** Two overcenter tension springs **77** (only one of which is seen in FIG. 1) are supported at one end on the knee pivot **67** of the toggle **65, 63** and at the other end, on the operating lever **59.** The insulating housing **11, 13** is provided with an opening **79** at the front part thereof, and a handle member **81** comprises an external handle part **83** that protrudes out through the opening **79** for manual operation. The handle member **81** comprises a molded insulating arcuate shield part **85** that closes the opening **79** in all positions of the handle member **81.** The handle part **83** is an insulating part molded integral with the arcuate shield part **85.**

The contact support member **73** comprises an inverted generally U-shaped rigid metallic support member that is supported for pivotal movement about a pin **87** that passes through openings in the opposite legs of the support member **73** and that is supported on the spaced plate parts of the supporting frame **55.** The contact support member **73** is fixedly connected to an insulating tie bar **89** by means of a metallic supporting bracket member **91.** The contact support arm **73** is also fixedly connected to another insulating tie bar **93** by means of suitable securing rivets **95.**

As is best seen in FIG. 3, a movable contact device **96,** comprising a rigid conducting arcing-contact support arm **97** and a rigid conducting bridging contact support arm **99,** is supported on the contact support member **73.** A support pin **101** is mounted on and between the opposite legs of the contact support member **73.** The arcing-contact support arm **97** is provided with an opening therein for receiving the pin **101** which opening is large enough to permit only pivotal movement of the arm **97** on the pin **101.** The bridging contact support arm **99** is provided with an elongated opening **103** therein which opening **103** is elongated to permit pivotal movement of the contact arm **99** about the pin **101** and also to permit the contact arm member **99** to move in a generally vertical direction (FIG. 1) which vertical movement is limited by engagement of the opposite ends of the slot or opening **103** with the pin **101.** A compression spring **105** is supported between the free end of the arcing-contact support arm **97** and a spring support **107** to bias the arm **97** in a counterclockwise direction about the pin **101.** A compression spring **111** is provided between one end of the bridging contact support arm **99** and a spring support **113.** Another compression spring **115** is provided between the contact support member **73** and the bridging contact support arm **99** in proximity to the the other end of the arm **99.** The springs **113, 115** bias the bridging contact support arm **99** downward as seen in FIGS. 1 and 3. The bridging contact support arm **99** is provided with a contact **119** at the lower side of one end thereof, for cooperating with the contact **33** (FIG. 1), and a contact **121** at the lower other end thereof for cooperating with the contact **43** (FIG. 1). The arcing-contact support arm **97** is provided with an arcing contact means **125** (FIG. 3) that comprises a first contact part **127** and a second contact part **129.** A flexible shunt conductor **131** is connected at one end thereof to the inner end of the arcing-contact support arm **97** by means of a screw **133** that passes through a suitable opening in the conductor **131** and that is threaded into a tapped opening in the arm **97.** An can be seen in FIG. 1, the flexible conductor **131** is connected at the other end thereof to the conductor **23** by means of a screw **137** that passes through a suitable opening in the conductor **131** and that is threaded into a tapped opening in the conductor **23.**

As can be seen in FIG. 4, the movable contact device for the center pole-unit comprises a single center arcing-contact support arm **97** and two identical bridging contact support arms **99** supported on opposite sides of the arm **97.** The contact arms **97, 99** are all supported on the support pin **101.** Although two bridging contact support arms **99** are disclosed in FIG. 4, it can be understood that a plurality of bridging contact support arms **99** could be supported on the pin **101** to provide an increased number of contact points of engagement during operation of the circuit breaker.

The movable contact devices of the two outer pole units are constructed in the same manner as that of the center pole unit (hereinbefore specifically described) with suitable support members in the outer pole units for supporting the supporting pins **87** of the movable contact devices of the outer pole units. As can be seen in FIG. 2, the three movable contact devices of the three poles of the circuit breaker are connected for simultaneous movement by means of the common tie bar **89** and the common tie bar **93.** The tie bars **89** and **93** pass through suitable openings in the insulating barriers that separate the pole-unit compartments, and suitable insulating members **141** are supported on the tie bars **89, 93** to cooperate with the insulating barriers of the housing **11, 13** to prevent the passage of arc gases betwen the pole unit compartments.

In each pole unit there is an arc-extinguishing structure indicated generally at **147.** The arc-extinguishing structure **147** comprises an insulating casing **149** having a plurality of stacked spaced arc plates **151** of magnetic

material supported thereon. The arc plates **151**, in top plan view, are generally U-shaped structures supported with the openings aligned and positioned such that the movable contact arm **97** moves within the openings during opening and closing operation of the contacts. During opening of the contacts, the magnetic field around the arc between the separating contacts, operating on the magnetic plates **151**, draws the arc inward toward the bight portion of the U-shaped plates (to the left as seen in FIG. 1) where the arc is broken up into a plurality of serially related arc portions to effect extinction of the arc in a manner well known in the art.

The operation of the circuit breaker operating mechanism **53** and trip device **45** is more specifically described in the patent to A. R. Cellerini, Pat. No. 3,141,081. Thus, only a brief description of the operation is given herein.

The circuit breaker is shown in FIG. 1 in the open position with the trip member **69** in the latched position. In order to close the circuit breaker the handle structure **81** is moved in a counterclockwise direction about the pivot **61** from the "open" or "off" position to the "closed" or "on" position. During this movement, the springs **77** are moved to straighten the toggle **63, 65** to thereby rotate the contact support member **73** of the center pole unit in a counterclockwise direction about the pivot **87** to the closed position. With the three contact support members **73** being supported for simultaneous movement by means of the tie bars **89, 93**, this movement serves to simultaneously move all three of the movable contact devices to the closed position. When it is desired to manually open the circuit breaker, the handle structure **81** is moved in a clockwise direction about the pivot **61** to the open or "off" positions seen in FIG. 1. This movement serves to move the springs **77** to cause collapse of the toggle **63, 65** to thereby move the contact support member **73** of the center pole unit about the associated pivot **87** to the open position seen in FIG. 1. This movement, because all of the contact arms are supported for simultaneous movement by means of the tie bars **89, 93**, moves all three of the movable contact devices to the open position. Each of the movable contact devices moves about the associated pivot pin **87** with all of the movable ocntact devices moving about a common axis.

When the circuit breaker is in the closed position and an overload current occurs in any of the three pole units, the trip device **45** is operated to automatically release the latch structure **51** to thereby release the trip member **69**. Upon release of the trip member **69**, the springs **77** act to rotate the trip member **69** in a counterclockwise (FIG. 1) direction about the pivot **72** to cause collapse of the toggle **63, 65** and movement of the movable contact devices of the three pole units to the open position in a manner well known in the art. Upon tripping movement of the circuit breaker the handle structure **81** is moved to an intermediate position between the "off" and "on" positions to provide a visual indication that the circuit breaker has been tripped open.

It is necessary to reset and relatch the circuit breaker mechanism following an automatic opening or tripping operation before the contacts can be closed. Resetting and relatching is affected by moving the handle structure **81** clockwise (FIG. 1) to the extreme "off" or "open" position. During this movement, a shoulder projection **157** on the operating lever **59** engages a shoulder part **159** on the trip member **69** to move the trip member **69** in a clockwise direction. Near the end of this movement, the free or latching end of the trip member **69** is reengaged with the latch structure **51** in a well known manner. The circuit breaker can then be manually operated to the closed position by operation of the handle **81**.

The movement of the movable contact device during operation of the circuit breaker will be best understood with reference to FIGS. 1 and 5–7. The contacts are shown in FIG. 5 in the closed position. In this position, the spring **105** biases the arcing-contact support arm **97** in a counterclockwise direction about the pin **101** to provide contact pressure between the arcing contacts **125, 129**. The springs **111** and **115** bias the contact members **99** downward to provide contact pressure between the contacts **119, 33** and between the contacts **121, 43**.

In the closed position of the contacts, the circuit through each pole unit extends from the conductors **19** on the right through the terminal **17**, the conductor **39**, the conductor **23**, the movable contact device **96**, the conductor **21**, the terminal **15** to the conductors **19** on the left. The circuit is bridged from the conductor **23** to the conductor **21** by means of the movable contact device **96**. In the closed position of the contacts, most of the current will travel through the two solid rigid bridging contact arms **99**. Thus, most of the current will extend from the conductor **23** through the contacts **43, 121**, the bridging contact arms **99**, the contacts **119, 33** to the conductor **21**. Some of the current will bridge the conductors **23, 21** through a parallel conducting path from the conductor **23** through the flexible conductor **131**, contact arm **97**, the contacts **129, 29**, to the conductor **21**. Because the solid bridging contact arms **99** are provided with relatively low resistance contacts **119, 121** to cooperate with the relatively low resistance contacts **33, 43**, and because the conductor **99** is a solid rigid member of good conducting material, most of the current flow in the closed position will flow through the bridging contact arms **99** so that the flexible shunt conductor **131** and connections at **133** and **137** will carry relatively less current and be less subject to heat-rise that might otherwise occur if the flexible conductor **131** were to carry all of the current, which heat-rise could cause deterioration of the connections and which heat-rise and deterioration could increase as the connections deteriorate and weaken. Moreover, the flexible conductor **131** can have a lower cross section so that it will take up less space in the circuit breaker housing and so that it will be less likely to cause interference with the mechanical movement of parts and with the contact pressure affected by the parts in the closed position.

During an opening operation of the circuit breaker, the contact support member **73** moves in a clockwise (FIG. 1) direction about the pivot **87**. During this movement, the contact support arms **99, 97** are first moved to the position seen in FIG. 6 in which position the contacts **33, 119** have separated before separation of the contacts **121, 143** and before separation of the contacts **29, 125**. During this initial movement the pin **101** has moved in the slots **103** to the upper end of the slots to pull the contact support arms **99** upward. During the opening operation when the contacts reach the position seen in FIG. 6, the current is all carried by the arcing-contact support arm **97** and flexible conductor **131** since the contacts **33, 119** have separated to stop the current flow through the bridging contact support arms **99**. An arc may be drawn between the contacts **33, 119**, which arc will be attracted toward the magnetic plates **151** of the arc chute **147** (FIG. 1). Further movement of the movable contact device **96** causes separation of the contacts **43, 121** to the position shown in FIG. 7. Thereafter, the contacts **125, 29** separate and an arc is drawn between these contacts, which arc is extinguished in the arc-extinguishing structure **147** to interrupt the circuit. The contact **125** is shown as a double contact **127, 129** since it can be constructed of different material at the different contact points to provide material at **129** having increased heat resistance as the contact part **129** will carry the final arc as it is drawn toward the left into the arc-extinguishing structure **147**. The contacts are shown in the open position in FIG. 1. During closing operations the reverse sequence will take place. The contacts **125, 29** will first engage, and then the contacts **43, 121** will engage and finally the contacts **33, 119** engage. Under arcing conditions, the contacts **29, 125** can become pitted and the resistance between these contacts can increase. As the resistance between the con-

tacts 29, 125 increases the intensity of the arc drawn between the contacts 33, 119, which contacts are the first to open, can increase. Thus, it is important to provide that the contacts 33, 119 will open, to transfer current to the contact arm 97 and flexible conductor 131, before the contacts 43, 121 open so that the intensified arc will occur in proximity to the arc-extinguishing structure 147 where the heat can be dissipated in the arc-extinguishing plates 151 and where the arc, if severe enough, can be magnetically drawn into the plates 151 where it will be extinguished. During the opening operation, the shunt 131 need carry the full current through the associated pole unit for only a very short time before the arc is extinguished to interrupt the circuit in the pole unit.

It will be understood that the operation previously described will be the same if the number of bridging contact support arms 99 is increased to provide increased contact engaging surfaces in the closed position. For example, each of the two contact arms 99 (FIG. 4) could be split in two lengthwise and along a plane parallel to the plane of the paper as seen in FIG. 1, to provide four bridging contact support arms 99 each of which would be half as wide as each of the bridging contact support arms 99 as seen in FIG. 4.

From the foregoing, it can be understood that there is provided by this invention an improved circuit breaker comprising a pair of spaced solid rigid stationary conductors and a movable contact device for bridging the spaced conductors in the closed position of the contacts. The spaced conductors are rigid solid members and the movable contact device comprises a pair of rigid solid bridging contact support arms that bridge the stationary conductors in the closed position to provide a current path of rigid solid conductors in the closed position of the contacts. The pair of bridging contact support arms are resiliently mounted on a supporting pin that extends through elongated slots in the bridging contact support arms, which slots are elongated to permit the bridging contact support arms to be spring biased downward for contact pressure in the closed position. An arcing-contact support arm of rigid solid conducting material is pivotally mounted on the supporting pin between the bridging contact support arms. The arcing-contact support arm is spring biased about the supporting pin to provide contact pressure in the closed position. The arcing contact support arm has an arcing contact thereon for cooperating with a stationary arcing contact on one of the rigid stationary conducting members. An arc-extinguishing structure, comprising a plurality of slotted magnetic plates, is positioned in proximity to the stationary arcing contact, and the movable arcing contact moves generally within the slots of the plates to draw an arc that is magnetically drawn back into the magnetic plates for extinction in a manner well known in the art. A first of the stationary conductors supports the stationary arcing contact in the arc-extinguishing structure and the first stationary conductor also supports a pair of second stationary contacts in proximity to or adjacent the space between the spaced stationary conductors. The second of the spaced stationary conductors supports a pair of third stationary contacts in proximity to or adjacent the space between the spaced stationary conductors. The arcing contact on the arcing-contact support arm can be termed a first movable and arcing contact, and each of the bridging contact support arms supports a second movable contact for cooperating with the associated second stationary contact and a third movable contact for cooperating with the asscciated third stationary contact. The contacts can comprise surfaces of the associated conducting supports or separate contact members welded or otherwise secured to the associated conducting supports. A flexible conductor is connected to the arcing-contact support arm and to the second stationary conductor. During opening operations the second contacts open first so that any arcs that may be drawn between the bridging contact arms and the associated contacts will be drawn in proximity to the arc-extinguishing structure. During the opening operations and after the above-identified second contacts have separated the entire current flows through the arcing-contact support arm and flexible conductor for a very short time before the circuit is interrupted. After the above-identified second contacts have separated, the above-identified third contacts separate and then the arcing contacts separate. As the arcing contacts separate the arc drawn between these separating contacts is magnetically drawn in to the arc-extinguishing structure to be extinguished in a manner will known in the art.

The circuit breaker is an insulating-housing or molded-case type circuit breaker with a current path extending lengthwise in the breaker housing from terminal to terminal. With the provision of solid ridged bridging contact support arms bridging the solid rigid stationary conductors 23, 21 there is a current path of solid ridged conductors from the terminal 17 to the terminal 15. The parallel current path, that bridges the stationary conductors 23, 21 through the flexible conductor 131 and the arcing-contact support arm 97, conducts only a small part of the current through the associated pole unit in the closed position of the contacts. The parallel current path carries all of the current through the associated pole unit for only a very short time during opening operations of the circuit breaker. The molded-case circuit breaker can effectively carry increased curents in a relatively small space without undue heating. Although two bridging contact support arms were specifically described, it can be understood that the movable contact device could comprise more or less than two bridging contact support arms without departing from the spirit of the invention. For example, in certain applications it may be desirable to provide an increased number of points of contact engagement in which case more than two bridging contact support arms could be mounted on the movable contact support member.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details and arrangement of parts thereof may be made without departing from the spirit of the invention.

We claim as our invention:

1. A circuit breaker comprising a circuit-breaker structure, said circuit-breaker structure comprising a first stationary conductor, a second stationary conductor spaced from said first stationary conductor, an arc-extinguishing structure, a first and arcing stationary contact means on said first stationary conductor in proximity to said arc-extinguishing structure, a second stationary contact means on said first stationary conductor, a third stationary contact means on said second stationary conductor,

a movable contact device, said movable contact device comprising a movable support member, an arcing-contact support arm connected to said support member for movement with said support member between open and closed positions and for limited movement relative to said support member, a first and arcing movable contact on said arcing-contact support arm, arcing-contact-pressure spring means biasing said arcing-contact support arm relative to said support member toward said first and arcing stationary contact means, a pair of bridging contact support arms supported on said support member on opposite sides of said arcing-contact support arm for movement with said support member between open and closed positions and for limited movement relative to said support member, a separate second movable contact and a separate third movable contact supported on each of said bridging contact support arms, bridging-contact-pressure spring means biasing said bridging contact support arms relative to said support member toward said second and third stationary contact means,

said movable contact device being movable between closed and open positions to close and open an

electric circuit, in the closed position of said contacts said first and arcing movable contact engaging said first and arcing stationary contact means, said second movable contacts engaging said second stationary contact means and said third movable contacts engaging said third stationary contact means, and during each opening operation of said movable contact device said second movable contacts disengaging from said second stationary contact means to transfer current to said arcing-contact support arm and thereafter said arcing movable contact moving away from said first and arcing stationary contact means whereby an arc is drawn between said first and arcing movable contact and said first and arcing stationary contact means to interrupt the current between said first and second stationary conductors.

2. A circuit breaker according to claim 1, said first stationary conductor said second stationary conductor said arcing-contact support arm and said bridging contact support arms all being generally rigid conducting members, a flexible shunt conductor electrically connecting said arcing-contact support arm with said second stationary conductor whereby in the closed position of said contacts there is a first conducting path from said second stationary conductor through said flexible shunt conductor said arcing-contact support arm said first and arcing movable contact said first and arcing stationary contact means to said first stationary conductor,

and whereby in the closed position of said contacts there are a pair of main parallel conducting paths from said second stationary conductor through said third stationary contact means said third movable contacts said bridging contact support arms said second movable contacts said second stationary contact means to said first stationary conductor,

and during each opening operation of said movable contact device said second movable contacts moving away from said second stationary contact means while said third movable contacts engage said third stationary contact means to thereby transfer current from said pair of main parallel conducting paths to said first conducting path and thereafter said first and arcing movable contact moving away from said first and arcing stationary contact means to draw an arc between said first and arcing movable contact and said first and arcing stationary contact means which arc is extinguished in said arc-extinguishing structure to interrupt the circuit between said first and second stationary conductors.

3. A circuit breaker according to claim 1, said circuit breaker comprising an insulating housing, said circuit-breaker structure being supported within said insulating housing, said arc-extinguishing structure being positioned in proximity to one end of said insulating housing, said first and second stationary conductors being fixedly supported within said insulating housing in a spaced lengthwise relationship in said insulating housing, said first and arcing stationary contact means being fixedly supported on said first stationary conductor in proximity to said arc-extinguishing structure, said second stationary contact means being fixedly supported on said first stationary conductor, said third stationary contact means being fixedly supported on said secondary stationary conductor,

said support member comprising a generally U-shaped member comprising a bight portion and a pair of opposite leg portions, means connecting said arcing contact support arm to said support member between the leg portions of said support member for movement with said support member between open and closed positions and for limited movement relative to said support member, said arcing-contact-pressure spring means being positioned between said arcing-contact support arm and said support member to bias said arcing-contact support arm relative to said support member toward said first and arcing stationary contact means.

said pair of bridging contact support arms being connected to said support member between the leg portions of said support member on opposite sides of said arcing-contact support arm, a separate bridging-contact-pressure spring means between each of said bridging contact support arms and said support member to bias the associated bridging contact support arm relative to said support member toward said second and third stationary contact means,

in the closed position of said circuit breaker said arcing-contact-pressure spring means biasing said arcing-contact support arm to provide contact pressure between aid arcing movable contact and said first and arcing stationary contact means and each of said separate bridging-contact-pressure spring means biasing the associated bridging contact arm to provide contact pressure between the associated second and third movable contacts and said second and third stationary contact means,

and during each opening operation of said circuit breaker said arcing-contact-pressure spring means biasing said arcing-contact support arm to maintain engagement between said first and arcing movable contact and said first and arcing stationary contact means while said second movable contacts disengage from said secondary stationary contact means whereby current is transferred to said arcing-contact support arm and thereafter said arcing-contact support arm moving with said support member to disengage said arcing movable contact from said first and arcing stationary contact means such that an arc is drawn between said first and arcing movable contact and said first and arcing stationary contact means to interrupt the current between said first and second stationary conductors.

4. A circuit breaker according to claim 2, said support member comprising a generally U-shaped member comprising a bight portion and a pair of opposite leg portions, said arcing-contact support arm being positioned between the leg portions of said support member for movement with said support member between open and closed positions and for limited pivotal movement on said support member relative to said support member, said arcing-contact-pressure spring means being positioned between said arcing-contact support arm and said support member to bias said arcing-contact support arm relative to said support member toward said first and arcing stationary contact means,

said pair of bridging contact support arms being supported on said support member between the leg portions of said support member on opposite sides of said arcing-contact support arm, a separate bridging-contact-pressure spring means between each of said bridging contact support arms and said support member biasing the associated bridging contact support arm relative to said support member toward said second and third stationary contact means,

and during each opening operation of said movable contact device said second movable contacts moving away from said second stationary contact means while said third movable contacts engage said third stationary contact means to thereby transfer current from said pair of bridging contact support arms to said first conducting path and thereafter said first and arcing movable contact moving away from said first and arcing stationary contact means to draw an arc between said first and arcing movable contact and said first and arcing staionary contact means which arc is extinguished in said arc-extinguishing structure to open a circuit between said first and second stationary conductors.

5. A circuit breaker according to claim 4, said circuit breaker comprising an insulating housing, said circuit-breaker structure being supported within said insulating

housing, said arc-extinguishing structure being positioned in proximity to one end of said insulating housing, said first and second stationary conductors being fixedly supported in said insulating housing and extending in a spaced lengthwise relationship in said insulating housing from said one end toward the other end of said insulating housing, said second stationary contact means being fixedly positioned on said first stationary conductor in a position along the length of said insulating housing between said first stationary and arcing contact means and the space between said first and second stationary conductors whereby said second stationary contact means is positioned in a position along the length of said insulating housing between said first and arcing stationary contact means and said third stationary contact means, and said first and arcing stationary contact means being fixedly supported on said first stationnary conductor generally within said arc-extinguishing structure.

6. A circuit breaker according to claim 5, and means supporting said support member for movement between open and closed positions about a fixed pivot.

7. A circuit breaker according to claim 5, and each of said bridging-contact-pressure spring means comprising a pair of compression springs supported between the associated bridging contact support arm and said support member in proximity to the opposite ends of the associated bridging contact support arm.

8. A circuit breaker according to claim 2, said circuit breaker comprising an insulating housing having an opening in the front thereof, said circuit-breaker structure being supported within said insulating housing, said circuit-breaker structure comprising an operating mechanism, said operating mechanism comprising a releasable member supported in a latched position, a toggle comprising a first toggle link pivotally connected to said support member and a second toggle link pivotally connected to said releasable member, said first and second toggle links being pivotally connected at a knee pivot, an operating lever supported for pivotal movement and comprising an operating handle extending through said opening in the front of said housing, spring means connected between said knee pivot and said operating lever, said handle being movable to a closed position to move said spring means to straighten said toggle to thereby move said support member to move said movable contact device to the closed position, said handle being movable to an open position to move said spring means to thereby collapse said toggle to move said movable contact device to the open position, and with said movable contact device in the closed position said releasable member upon release thereof automatically moving under the force of said spring means to effect collapse of said toggle and opening of said movable contact device.

9. A circuit breaker according to claim 8; said circuit breaker being a multi-pole circuit breaker and comprising a first stationary conductor and second stationary conductor for each of said pole units; said circuit breaker comprising a first and arcing stationary contact means, a second stationary contact means and a third stationary contact means for each pole unit, said circuit breaker comprising a separate of said movable contact devices for each pole unit; and tie bar means connecting all of said movable contact devices for simultaneous movement.

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